AVERAGE DAILY INTAKE OF PESTICIDE RESIDUES THROUGH MILK FOR EGYPTIANS

BY

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ABSTRACT

The average daily intake of some pesticide residues for the Egyptian persons and for infants during their first year of life (6 Kg) was estimated based on the average daily intake of milk.

The estimated daily intake of aldrin and dieldrin; chlordane; ΣDDT, endrin, heptachlor, lindane and dimethoate in all milk samples for Egyptians were: 0.000041; 0.000032; 0.0001079; 0.000023; 0.000066; 0.000006 and 0.000016 mg/kg b.w. respectively. Also, the estimated daily intake of the same residues in milk for Egyptian infants were: 0.000601 mg/kg for aldrin and dieldrin; 0.000474 mg/kg for chlordane; 0.01631 mg/kg for ΣDDT; 0.000345 mg/kg for endrin; 0.009403 mg/kg for heptachlor; 0.000096 mg/kg for lindane and 0.000243 mg/kg for dimethoate. While the acceptable daily intake for that pesticides are: 0.0001; 0.0005; 0.02; 0.0002; 0.0001; 0.0001 and 0.01 mg/kg respectively.

INTRODUCTION

During the present century, especially during the last three decades, it has become increasingly evident that certain chemical contaminants can produce diseases after a latent period of months or years. Thus, it is no longer sufficient to ensure that food does not contain contaminants at such levels that lead to acute intoxication, but it is also necessary to guard against the possibility of effects appearing after a long latent period (GEMS 1991).

Milk contains the highest residue levels compared to any other food group. Residues of aldrin and dieldrin, heptachlor, lindane, endrin, HCB and HCH (DHC), are generally below MRL's with a few exceptions and are slowly declining in developed countries such as the USA, Canada and Netherlands as well as some developing countries. There is no evidence of changes in these levels with time as the general trend is maintained save for Germany, Japan and some developing countries, where the level is increasing at a high rate. Whereas for DDT, its continued use in public health in some countries as India leads to the increased residue levels in these countries only. However, most of these countries did not submit data for DDT. Other countries follow the common trend for organochlorine pesticides in general (GEMS, 1991).

Organophosphorous pesticide residues in milk, if any, are almost always below detection level, no countries reported to GEMS/food any such residues (GEMS, 1991).

High daily intakes of PCB's in New Zealand from dairy products were reported by Pickerton et al., (1985). Median levels of PCB's in 14 countries as reported in GEMS/food were below 20 µg/kg in dairy milk and were substantially higher in human milk. A general decreasing trend is seen in several countries except for Germany and Sweden where it is increasing. (GEMS, 1991).

EZL et al., 1991 reported the average daily intake of some pesticide residues for the Egyptian infants in the first year of life from milk but the average daily intake of different food as assessed in previous surveys. Results indicated that estimated daily intake (EDI) for dieldrin and endrin were 0.002187 and 0.000626 mg/kg b.w. Which exceeded the acceptable daily intake (ADI) established by the FAO/WHO.

The EDI for ΣDDT and lindane residues were below the ADI being 0.02 and 0.008 mg/kg b.w. respectively. Further more the main bulk of pesticide residues intake is obtained from the different types of milk.

Yoshida et al., 1986 studied the daily intake of pesticides in infants (0 - 3 years old). They found that HCH was detected in 100% of samples collected. DDT, dieldrin were found in 92% and 89% of samples respectively.

The average daily intake of HCH, DDT, dieldrin were 1.00, 0.45 and 0.17 mg/kg respectively.

MATERIALS AND METHODS

Milk Samples:
A total of 390 samples of fresh cow and buffalo milk and 135 packed ultra-high treated milk samples were collected from Great Cairo. Only 44 of the packed samples contained powder milk which imported from other countries.

The herds produced the bulk milk samples can be divided into 19% of herds consumed concentrates and feed which produced 14% of all samples. Only 9% of herds consumed greens and produced 7% of the samples. The remaining herds (72%) which produced bulk milk constituting 53% of samples were unspecified. All of herds that produced packed samples constituting 26% of the samples were unspecified.

Extraction, clean up and determination:
The same methods conducted before by Abdel Fatah et al., 1992 were conducted.

Daily intakes:
Estimated Daily Intakes (EDIs) from milk alone, for the detected pesticide residues were calculated according to the data regarding the consumption of milk by the population at...
Table (4): Estimated Daily Intake (EDI) from pesticides detected in all milk samples for Egyptian infants in mg/kg bw compared to the established Acceptable Daily Intake (ADI).

<table>
<thead>
<tr>
<th>Pesticide</th>
<th>EDI</th>
<th>ADI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrin &amp; Dieldrin</td>
<td>0.000601</td>
<td>0.00010</td>
</tr>
<tr>
<td>Chlordane</td>
<td>0.0009437</td>
<td>0.00085</td>
</tr>
<tr>
<td>Testosterone</td>
<td>0.016031</td>
<td>0.02000</td>
</tr>
<tr>
<td>Ecdyosone</td>
<td>0.063045</td>
<td>0.000002</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>0.009803</td>
<td>0.00001</td>
</tr>
<tr>
<td>Lindane</td>
<td>0.000096</td>
<td>0.000080</td>
</tr>
<tr>
<td>Dinitrochloride</td>
<td>0.002243</td>
<td>0.01000</td>
</tr>
</tbody>
</table>

Discussion

The Estimated Daily Intake (EDI) of Aldrin and Dieldrin residues for Egyptians from milk was less than 46% of the established Acceptable Daily Intake (ADI) being 0.000446 mg/kg bw and 0.000414 mg/kg bw, based on both FAO and CAPMAS estimates.

Whereas, the Estimated Daily Intake (EDI) of Aldrin and Dieldrin residues for Egyptian infants from milk was 13 times that of the general population, and it was 6 folds the established Acceptable Daily Intake (ADI) being 0.000601 mg/kg bw.

The estimated Daily Intake (EDI) of chlordane residues for Egyptians from milk was less than 10% of the established Acceptable Daily Intake (ADI) being 0.000037 mg/kg bw and 0.000032 mg/kg bw.

Whereas, the Estimated Daily Intake (EDI) of chlordane residues for Egyptian infants from milk was 15 times that of the general population, and it was less than 95% of the established Acceptable Daily Intake (ADI) being 0.000474 mg/kg bw.

The Estimated Daily Intake (EDI) of DDT residues for Egyptian infants from milk was 15 times that of the general population, and it was less than 81% of the established Acceptable Daily Intake (ADI) being 0.016031 mg/kg bw.

The Estimated Daily Intake (EDI) of Dieldrin residues for Egyptians from milk was less than 15% of the established Acceptable Daily Intake (ADI) being 0.000026 mg/kg bw and 0.000023 mg/kg bw.

Whereas, the Estimated Daily Intake (EDI) of Dieldrin residues for Egyptian infants from milk was 15 times that of the general population, and it was more than 1.7 folds the established Acceptable Daily Intake (ADI) being 0.000345 mg/kg bw.

The estimated Daily Intake (EDI) of Heptachlor residues for Egyptian infants from milk was 6.6 times the established Acceptable Daily Intake (ADI) from milk alone being 0.000754 mg/kg bw and 0.000660 mg/kg bw.

Whereas, the Estimated Daily Intake (EDI) of Heptachlor residues for Egyptians from milk was 15 times that of the general population, and it was more than 98 folds the established Acceptable Daily Intake (ADI) being 0.0009603 mg/kg bw.

The Estimated Daily Intake (EDI) of Lindane residues for Egyptians from milk was less than 0.1% of the established Acceptable Daily Intake (ADI) being 0.00000007 mg/kg bw and 0.0000006 mg/kg bw, based on both FAO and CAPMAS estimates.

Whereas, the Estimated Daily Intake (EDI) of Lindane residues for Egyptian infants from milk was 15 times that of the general population, yet it was less than 1.2% of the established Acceptable Daily Intake (ADI) being 0.0000096 mg/kg bw.

The Estimated Daily Intake (EDI) of Dieldrin residues for Egyptian infants from milk was less than 0.2% of the established Acceptable Daily Intake (ADI) being 0.000019 mg/kg bw and 0.000016 mg/kg bw based on both FAO and CAPMAS estimates.

Whereas, the Estimated Daily Intake (EDI) of Dieldrin residues for Egyptian infants from milk was 15 times that of the general population, yet it was less than 5% of the established Acceptable Daily Intake (ADI) being 0.000243 mg/kg bw.

As there were no residues of PCB's and Malathion in milk samples, the EDI's were not estimated.

Pesticide residues and nutrition interact in a variety of ways. Optimal nutrition is mandatory of avoid the dermatological or other nutritional pathologies as malnutrition may render the body more accessible to pesticides by weakening natural barriers such as respiratory epithelium and GIT mucosa. Hence pesticides enter the blood stream more quickly and in larger quantities enhancing their toxicity. Vitamin A and C deficiencies affect the integrity of the skin and its vascular system (Churchdick et al., 1971). Protein, mineral and lipoteral deficiencies cause skin lesions; deficiency in B group of vitamins affects the skin, mucous membranes and mucocutaneous junctions of eyes, nose and mouth; vitamin A deficiency makes the epithelial lining of the respiratory tract more permeable; chronic malnutrition affects the GIT in general and especially its absorptive function, leading to uninhibited and unconjugated absorption of pesticides directly into the blood stream "Cathhrae 1967". Pesticides may influence the dietary and nutritional status by the decrease of appetite; induction of weight loss; alteration of nutrient requirements; and affect micro and macro nutrient storage sites such as the liver. Furthermore, they may affect specific metabolic pathways; increase excretion of nutrients or their metabolities; compete for a specific blood-binding site of a micro nutrient (a pesticide may require a protein fraction such as albumin as a carrier and displace vitamin A); bind with any money of nutritional significance (dieldrin binds with hemoglobin and albumin); be under a metabolic effect which increases the risk of disease (DDT induces hypolipoproteinemia, as it is transported in low density lipoproteins); may injure the microsomal fractions necessary for enzyme induction, which in turn are required for metabolic and detoxifying processes; and be distributed in organ systems which have nutrient digestive, utilization, absorption and excretion function (eg. dieldrin is excreted into bile and pancreatic juice, which may then influence dietary nutrient absorptions (Davis et al., 1985). Increased protein intake reduces the effect of pesticides, exposure alters plasma amino acid concentrations. (Lee et al., 1964, Boyd et al., 1968, Boyd and Chen 1986, Boyd and De Coster 1968, Weatherholtz 1968, and Shukman 1974).

Organochlorine pesticides being solubile in adipose tissue are mobilized during weight loss and starvation to elevated plasma, renal and hepatic levels as well as human milk levels. (Dale et al., 1962, and Keane et al., 1969). The potential of metabolic hazards induced by pesticides periodically leaking into the circulation during weight loss are to be considered, especially with starvation
REFERENCES

The references are listed below for further reading.


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